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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Gaming and Video Lottery Terminal Door Frames and Method  
of Making Same

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(57) 4 Claims

Notice: This application is as filed and may therefore contain an  
incomplete specification.



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**ABSTRACT OF THE DISCLOSURE**

The invention provides a method of making a metal door frame for a currency-operated commercial machine. The method comprises the steps of: passing predetermined relative amounts of metals to form a predetermined thixotropic-metal alloy into a temperature controlled barrel of a screw extruder; heating the metals under high shear-rate mixing to a semi-solid state to form a thixotropic mixture of said metals; injecting the thixotropic mixture of metals at high speed into a mold of the desired shape of the metal door frame; and cooling the mixture in the mold and ejecting the cooled mixture from the mold in the form of a net-shape door frame.

The present invention relates to an improved door frame, for example, for a gaming or video lottery terminal, and to a method of making same.

### **BACKGROUND OF THE INVENTION**

Conventionally door frames for gaming and video lottery terminals are  
5 manufactured according to a variety of processes requiring a considerable amount of technical skill. These methods currently require taking various sheet metal components and turning them into a single piece sheet metal door through the use of fusion welding. The frames conventionally have highly reflective surfaces and, for security reasons, must be strong and durable. Thus, they tend to be heavy.

10 Currently, the most durable finish being applied to door frames for gaming and video lottery terminals is that of chrome plating. Such a finish itself imposes special requirements on the fabrication process. Chrome by its very nature tends to highlight surface imperfections of a product.

The current method of construction of door frames for gaming and video  
15 lottery terminals consists of the following steps:

- (1) Shear/punch/break-form various gauges of sheet metal components in preparation for welding.
- (2) Using a weld fixture to precisely hold the component parts in correct relation to each other, they are then welded. The weld fixture must  
20 be designed in such a way as to compensate for weld shrinkage and the heat distortion inherent in the welding process. Welding is

accomplished using either gas tungsten arc welding or gas metal arc welding processes.

- 5 (3) After the door frame is welded, the welds are dressed. The dressing operation can be broken into three distinct steps: grinding, buffing and polishing.

- (4) Chrome is then applied to exterior surfaces of the door frame.

Conventionally, such a complicated procedure for manufacturing door frames for gaming and video lottery terminals, and indeed any other currency-operated commercial machines such as vending machines, has been because of the extremely close tolerances required for such door frames, to accommodate the aesthetic requirements as well as the security requirements inherent therein.

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#### **OBJECTS OF THE PRESENT INVENTION**

It is an object of the present invention to provide a door frame for such machines, and a method of making same, which will eliminate many of the technical skills and requirements required in conventional methods of making such door frames, to minimize the potential for product rejects and provide a better, final quality door frame.

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It is a further object of the present invention to provide a more consistent, lighter product at a lower per-part cost.

**SUMMARY OF THE INVENTION**

In accordance with the present invention there is provided a method of making a metal door frame for a currency-operated commercial machine. The method comprises the steps of: passing predetermined relative amounts of metals to form a predetermined  
5 thixotropic-metal alloy into a temperature controlled barrel of a screw extruder; heating the metals under high shear-rate mixing to a semi-solid state to form a thixotropic mixture of said metals; injecting the thixotropic mixture of metals at high speed into a mold of the desired shape of the metal door frame; cooling the mixture in the mold and ejecting the cooled mixture from the mold in the form of a solidified, net-shape door frame.

10 The invention also relates to a door frame for a gaming or video lottery terminal, or a door for a vending machine, made according to this method.

It will be understood that the door frame made according to the present method requires no welded parts. In addition, it requires no grinding and polishing steps. As will be described in more detail subsequently, the thixotropic alloys which can be used for making  
15 such door frames are relatively lightweight. Furthermore, the thixotropic molding process applied to such door frames permits the door frames to be made according to close tolerances with more reliability.

While the invention will be described in conjunction with an example embodiment, it will be understood that it is not intended to limit the invention to such  
20 embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

**DETAILED DESCRIPTION OF THE INVENTION**

The use of thixotropic materials in a molding process is a relatively new process, aspects of which are described and illustrated in U.S. Patents Nos. 4,694,881 and 4,694,882 of Busk issued September 22, 1987. In applying thixotropic molding processes to the manufacturing of doors for gaming and video lottery terminals and the like, the technologies of die-casting and plastic-injection molding using magnesium based alloys is used to produce a "net shape" casting in one step in a single machine. The term "net shape" is used to indicate that parts produced according to this process do not require additional machining to dimensionally meet machine drawing requirements.

The process in question consists of introducing alloy feed stock (for example aluminum and magnesium in relative amounts to produce a thixotropic mixture and a final alloy product having the desired characteristics) at room temperature to the heated barrel and screw of a modified injection molding machine. The temperature of the alloy feed stock material is then raised to the semi-solid region under high shear rate mixing. This results in a thixotropic (viscose) material that flows like a plastic. The semi-solid mixture is then injected at a very high speed, maintaining its ideal flow throughout the injection phase, into a pre-heated metal mold under vacuum to produce a net shape part. While aluminum-magnesium alloys are considered being the ideal thixotropic material for the process and products of the present invention, it is envisaged that other metal alloy compositions will also be suitable.

The mold in question is fabricated once the dimensions of a particular door frame have been finalized. That may be a single piece part or modular piece parts which

would allow for various configurations of doors to be built-up from a minimal number of molds. The mold is fabricated from heat treated tool steel. The surface finish desired for the finished net shape product is applied to the interior of the mold. For example a high polish surface finish would be applied to the interior of the mold for the equivalent reflectivity accomplished by chrome plating according to conventional processes. The desired surface finish would be consistently reproduced by the mold on every part produced in the mold.

With the mold completed, it is then used in the door frame production process. Cycle times can vary depending on the mass of the part being molded. Typical cycle times are less than sixty seconds.

The part or parts produced from the mold would be subjected to whatever minor finishing work was required depending on the end finish being applied to the part. The final door frame is then ready to be shipped to a customer.

The thixotropic molding process applied to such door frames allows the following unique advantages:

- (1) More complex door frame designs are possible, including thick and thin areas in the same part, without distortion. As well, intricate core shapes such as threads and exceptionally small holes can be provided.
- (2) Superior dimensional tolerances can be accomplished. These may be up to five times better than die-casting processes, due to the low shrinkage of magnesium.
- (3) The thixotropic molding process results in a product having very low porosity which is capable of holding pressure and vacuum without



additional impregnation. The door frame parts produced can also be heat treated.

- 5 (4) Generally the surface as produced by the molds requires very minimal or no finishing at all. The surface can, if required, be further chrome plated, powder coated or wet painted.
- (5) Door frame parts produced according to the process of the present invention are from 30% to 50% lighter than conventional die-cast aluminum door frame parts and typically 20 times stiffer than engineered resins.
- 10 (6) Currently parts as thin as .040 inches to as thick as .750 inches have been molded according to the method of the present invention, with excellent results.
- (7) Excess or rejected parts can be recycled for use again in the molding process.
- 15 (8) Because of the density of the net shape part, parts can also be fusion welded.

Thus, it is apparent that there have been provided in accordance with the invention a currency-operated commercial machine door frame, such as a gaming and video lottery terminal door frame and method of making same, that fully satisfy the objects, aims and advantages set forth above. While the invention has been described in conjunction with 20 a specific embodiment thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as

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fall within the spirit and broad scope of the invention.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:-**

1. A method of making a metal door frame for a currency-operated commercial machine which comprises the steps of:
  - (a) passing predetermined relative amounts of metals to form a predetermined thixotropic metal alloy into a temperature controlled barrel of a screw extruder;
  - (b) heating the metals under high shear-rate mixing to a semi-solid state to form a thixotropic mixture of said metals;
  - (c) injecting the thixotropic mixture of metals at high speed into a mold of the desired shape of the metal door frame;
  - (d) cooling the mixture in the mold and ejecting the cooled mixture from the mold in the form of a net-shape door frame.
2. A method according to claim 1 wherein the metals are selected from the group consisting of aluminum and magnesium.
3. A door frame for a gaming or video lottery terminal made according to the method of claim 1.

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4. A door frame for a commercial vending machine made according to the method of claim 1.

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